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But $pB_{\frac{1}{2}(p-1)} \equiv (-1)^{\frac{1}{2}(p-1)} \bmod p$.[1] Hence

$$T_{p-2} \equiv -2 \cdot \frac{2^{p-1}-1}{p} \mod p.$$

It follows from the above formulas that for no value of k is T_{2k-1} congruent to zero for every odd prime p, though there are, in general, special primes for each value of $k > 3$ for which T_{2k-1} will be congruent to zero.

The residue of T_{p-2} is seen to depend upon the residue of $(2^{p-1}-1)/p$. The vanishing of this residue has been shown by Wieferich to be a necessary condition in order that Fermat's equation $x^p + y^p = z^p$ shall be solvable in integers prime to p. However, as stated on page 9 of *L'Intermédiaire des Mathématiciens*, January, 1914, this residue does vanish for $p = 1{,}093$, though for no other primes less than 2,000.

BOOK REVIEWS.

EDITED BY W. H. BUSSEY, University of Minnesota.

Plane and Solid Geometry. By WALTER BURTON FORD, Junior Professor of Mathematics in the University of Michigan, and CHARLES AMMERMAN, of the Wm. McKinley High School, St. Louis. Edited by EARLE RAYMOND HEDRICK. The Macmillan Company, New York, 1913. ix + 321 + xxxiii pages. $1.25. Plane and Solid in separate volumes $0.80 each.

Another interesting text-book of the series edited by Earle Raymond Hedrick, of the University of Missouri, has made its appearance; an attractive volume in a neat brown dress. The work, as we would expect, under Professor Hedrick's editorship, departs from the class of text-books written by scientists not in touch with life. The Euclidean division into books has been abandoned for the modern division into chapters.

The pupil is brought into touch with the subject matter of geometry in the introduction, covering 33 pages, which is divided into three parts: (I) Drawing simple figures, (II) the principal ideas used in geometry, (III) statements for reference. This division of the book contains 111 exercises. Squared paper is used to estimate areas and construct designs.

The arrangement of the subject matter of Plane Geometry in the first five chapters follows that of the usual modern standard text. Logical and original thinking are sure to be developed through the "judicious fusion of theoretical and applied work," here presented. There are approximately 750 exercises in these five chapters. Dr. Frank M. McMurry said, in a paper on "How to Study" given at the Minnesota State Teachers' Association last fall: "Do we in school know how to arrange the work so the pupil will learn to select? Teachers object to neglecting any part of the text. They dwell upon all parts with equal emphasis. Yet in life we have to select, and the exercise of choice is of first importance." The text in question helps the teacher to "exercise choice" very admirably. Different kinds of type are used to indicate the relative importance of theorems. Enough problems are given so that the exceptional pupil may have the stimulus he needs; the medium pupil a fair number; and the slow, plodding pupil enough to make the subject interesting and significant, yet not too difficult. The Appendix to Plane Geometry treats of maxima and minima.

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[1] *Quarterly Journal*, Vol. XXXII, p. 273.

The next three chapters—VI–VIII—are devoted to Solid Geometry. They are made attractive to look at by phantom half-tones. The reviewer would venture the criticism that these "phantom" half-tone engravings, while perhaps making the figures more realistic to the pupil, defeat one of the aims of solid geometry, that is, to develop the imagination. Many of the proofs of the theorems in this division of the book are given in outline only. There are 250 exercises in the Solid Geometry.

A decided innovation in this text is the introduction of three sets of tables. Table I gives the ratios of the sides of right triangles and chords and arcs of a unit circle. This indicates, of course, that the fundamental trigonometric ratios are introduced under proportion and similarity. All starred exercises indicate the use of these ratios. To quote from Article 112, "The relations between chords, arcs, and central angles of the same circle appear vividly in connection with rotations, ... Taking the radius as 1 unit, the lengths of the chords corresponding to various central angles for every degree from 0° to 90° are given in the table of chords." Table II gives powers and roots with an accompanying explanation for use. Table III gives a list of important numbers.

Very few historical notes are given. Such names as Pythagoras, Aristotle, Euclid and Bhaskara are mentioned in connection with famous theorems.

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A Text-Book of Mathematics and Mechanics, specially arranged for the use of students qualifying for science and technical examinations. By Charles A. A. Capito. Charles Griffin & Co., London; J. B. Lippincott Co., Philadelphia, 1913. xv + 398 pages.

As the title indicates this is a drill book for the use of persons preparing to take certain examinations; it is admirably adapted to this purpose and one can well believe that it grows out of a long and successful experience in coaching. The theory is presented concisely and, generally, with great clearness. Although extreme brevity characterizes the treatment throughout, space is devoted to the solution of numerous problems, most of which are taken from examination papers of recent date.

The author presumes a knowledge of elementary algebra and trigonometry, and begins with a section on plane analytic geometry, which is followed by sections on differential and integral calculus and mechanics, including hydromechanics